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Costs and returns in

FEEDING LAMBS, OHIO, 1957-58 Season

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COSTS AND RETURNS IN FEEDING LAMBS, OHIO, 1957-58 SEASON

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In recent years, sheep and wool production has accounted for nearly one-half billion dollars of income to farmers in the United States each year. Farmers in the 13 states of the North Central Region derived close to 200 million dollars income per year from sheep.

While sheep rank well below cattle, hogs, and poultry as a source of income, they are important in the areas where they are adapted. Their adaptation to Ohio conditions is indicated by the fact that Ohio has been, for many years, the leading state east of the Mississippi River in number of sheep on farms and in number of lambs fed. In Ohio, in recent years, sheep and wool have accounted for two and one-half percent of the cash receipts by farmers for livestock and livestock products.

In the Corn Belt, one-third of the lambs fattened are lambs shipped in from western states and the remainder are native lambs. In Ohio, western lambs make up only five to ten percent of the total number of lambs fattened and the remaining 90 to 95 percent are native lambs.

Total marketings of lambs from Ohio farms were approximately a million head per year in the early 1940's but dropped to less than half that number about 1950. Since then, marketings of lambs have increased to about two-thirds of a million head annually.

Fluctuations in the importance of lamb feeding in Ohio have been and will continue to be largely dependent on the relationships between costs and returns in lamb feeding and for alternative uses of the same resources.

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We wish to express our appreciation to Dr. George Johnson and other members of the Animal Science Department for their valuable suggestions.

OBJECTIVES

The purpose of this study was to secure up-to-date detailed information on the physical inputs and outputs and the dollar costs and returns for lamb feeding operations as carried out on typical Ohio farms.

Data are available from feeding trials and other studies regarding the requirements of feeder lambs for feed, space, equipment, etc. However, these data may not be applicable to commercial on-the-farm operations. Variations occurring in quantity, quality or timing of the inputs may produce more or less variation in profitability than in physical output.

HOW THE STUDY WAS MADE

Data on costs and returns in commercial lamb feeding operations were gathered from farmers' records by the modified cost route method during the winter and spring of 1958. Usable records were obtained for 26 projects located in 10 counties in central Ohio (see Figure 1). A total of 13,509 lambs were involved in these projects.

The period for which data were collected covered about 11 months, late July, 1957, through early June, 1958, although the maximum period on any one farm was about 10 months. Some of the farmers bought lambs as early as July or August to utilize available pasture. Typically, barn feeding began in October or November, and the projects were closed out in March or April.

At first it was hoped that some comparison of results with native Ohio and western feeding lambs could be made. But since only 700 western lambs, or about 6 percent of those included in this study, were being fed in these 26 projects, no comparisons were made. About 94 percent of the lambs fattened in these flocks were native lambs.

In many lamb feeding projects in Ohio, little or no record is kept of feed, labor or other inputs. When home-grown lambs are fed, initial weights of the lambs may be unknown. The sample for this study was selected for availability of data on inputs and production under farm conditions. Those feeders who were included had records of both inputs and production and purchased a majority of their feeder lambs over the scales.

It is recognized that, as a result of the methods used in selection of the sample, some bias in favor of the better managers, or at least in favor of the keepers of more complete records, may exist.

Informaton was collected and has been summarized in such a way as to compare different methods of feeding lambs, different sizes of

projects, and other management factors. Comparison of lamb feeding with alternative uses of the same resources, not included in this study, is facilitated by the summary of information.

Input factors and production are expressed in physical units to permit calculation of costs and returns using any desired level of prices. Calculations in this study are based on prices reported by the farmers for the feeding season, 1957-58.

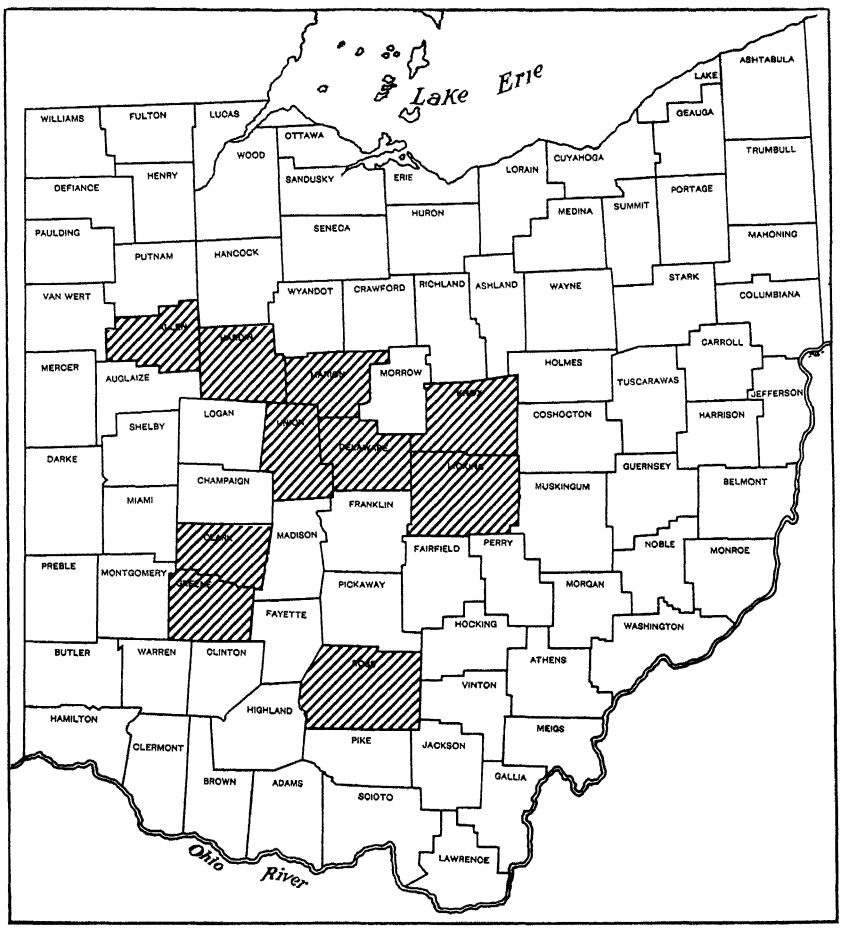

Fig. 1.—Counties in Which the 26 Lamb Feeding Projects in This Study Were Located

The analysis of both costs and returns has been based on the number of lambs sold rather than the number purchased. All costs of feeding lambs have been considered. Analysis is also made in terms of cash costs for those cases where labor, housing, equipment and pasture are considered as unsalable factors with no alternative use.

COSTS IN LAMB FEEDING

For the 26 projects included in this study in 1957-58, there was an average of $10,805 incurred in cost of feeder lambs and charges involved in fattening lambs. The largest item of cost, accounting for 65 percent of the total, was the purchase of the feeder lambs. In the average project, 520 head of lambs, weighing about 69 pounds per head, were purchased at a cost of $19.45 per cwt. or $13.61 per head. Because of death losses, 1.07 lambs were purchased for each lamb sold.

Feed items totalled 25 percent of the charges of the project. Farm grains and hay were valued at what they could have been sold for.[1] Grains, mostly corn, accounted for nearly two-thirds of the feed cost, while hay made up about one-fifth. Total feed cost was $5.69 per head sold.

Labor used averaged 331 hours per project or about five-sixths of an hour per lamb. Time spent in buying, selling and hauling lambs, daily and periodic chores, shearing, medication or treatment of lambs, and cleaning out (but not spreading) manure is included in this labor figure.[2]

Housing and equipment charge represents the annual cost of the buildings, feeders and other facilities actually used in caring for the lambs. Most of the lambs were housed in relatively weather-tight barns. The average project allowed seven and one-fourth square feet of barn space, including rack area, if completely confined, or six and

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[1]For uniformity, the average price paid to Ohio farmers for the period November, 1957, through April, 1958, was used for home-grown grains: corn, $1.13 per bushel; oats, $ .72 per bushel; and barley, $ .84 per bushel. Weight of corn was adjusted to fifteen and one-half percent moisture equivalent. Actual prices paid were used for purchased grains. Farmers' estimates of the value of the hay fed averaged $16.95 per ton and of straw, $14.34 per ton.

[2]The labor and machinery charge for hauling and spreading manure is treated as a charge against crops. Manure is credited to the project at its worth upon leaving the barn. Other methods of costing could have been used, but the net credit would have been the same. Similarly, labor required for repair and maintenance of buildings and equipment is covered in the charges for the use of these facilities.

one-half square feet of barn space plus about 12 square feet of outside lot space per lamb at the most crowded time. Some farmers added more feeder lambs as fat lambs were "topped out." This re-use of facilities reduced the cost and the space per lamb below what it would have been for one-time use. The average charge for housing and equipment was 41 cents per lamb or 2 percent of the total costs.

For feeding grain, about 9 inches of space at troughs and/or combination racks was provided per lamb in the average hand-fed project, with most cases falling between 7 and 12 inches. Where self-feeding was used, an average of one-tenth foot of self-feeder space for grain was provided per lamb.

Bedding represented only one percent of the total cost with only 23 pounds being used for the average lamb. This was supplemented with the uneaten portion of the 145 pounds of hay fed per lamb.

The remaining costs (shearing and twine, taxes, insurance and interest, veterinary and medicine, and miscellaneous other costs) have a common characteristic in that they ordinarily represent out-of-pocket costs or "cash dollar" expenses. These items totalled $507 per project or $1.17 per lamb sold and represented about 5 percent of the total costs.

RETURNS FROM LAMB FEEDING PROJECTS

Although lambs and wool are joint products, little opportunity exists for the secondary product to "bail out" an unprofitable project. For these 26 projects, returns averaged $11,228, of which 89 percent was derived from the sale of market lambs. About 8 percent came from wool sales and government subsidies on wool, while about 3 percent of the returns were in the form of credit for manure (see Table 1).

Mortality of 6 percent reduced the number of lambs sold to 487 per project. On the average, the lambs sold weighed 93 pounds and brought $22.28 per cwt. or $20.71 per head after marketing expenses such as trucking, yardage and commission were deducted. Difference between average weight of lambs as bought and sold was about 24 pounds, but gain in weight was about 29 pounds, the difference being due to wool removed.

Five-sixths of the lambs purchased were shorn. The resulting fleeces averaged 5.0 pounds in weight and brought about 41 cents per pound including subsidy.[3] Income from wool averaged $888 per project.

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[3]Subsidy was computed by the formula used by the Agricultural Stabilization Committee for the applicable marketing year. Subsidies averaged 9 cents per lamb sold.

Manure produced by the lambs was valued at what the same nutrient elements would have cost in the form of commercial fertilizer, less the differential cost of removal and spreading or $2.77 per ton of manure. Production of 91 tons per farm added $252 to the total returns. This was equivalent to 52 cents per lamb sold.

TABLE 1.—Costs and Returns per Enterprise and per Lamb Sold in 26 Commercial Lamb Feeding Projects, Ohio, 1957-58 Season

Item	Per project		Per lamb sold		Percent of total value
	Amount	Value	Amount	Value	
Purchase of feeder lambs	520 lambs	$ 7011.03	1 lamb	$13.61	60
Grain	80505 lbs.	1680.98	168 lbs.	3.46	15
Hay	30 tons	495.90	145 lbs.	1.24	5
Purchased feed*	8268 lbs.	373.45	15 lbs.	.69	3
Feed processing and hauling	----------	96.01	----------	.17	1
Pasture†	760 AU days	51.15	2.1 AU days	.13	1
Total feed		$ 2697.49		$ 5.69	25
Labor	331 hours	$ 331.23	.83 hours	$ .83	4
Death loss			6.2 percent	.68	3
Shearing and twine		215.05		.48	2
Housing and equipment	2817 sq. ft.	193.02	5.9 sq. ft.	.41	2
Tax, insurance, and interest	----------	184.89	----------	.41	2
Veterinary and medicine	----------	76.53	----------	.20	1
Straw	4 ½ tons	65.39	23 lbs.	.17	1
Miscellaneous other costs	----------	30.44	----------	.08	‡
Total of all costs		$10805.07		$22.56	100
Sale of market lambs	487 lambs	$10087.48	93 lbs.	$20.56	89
Wool sales and subsidy	2148 lbs.	888.18	4.6 lbs.	1.83	8
Manure credit	91 tons	252.30	.2 ton	.61	3
Total returns		$11227.96		$23.00	100
Net returns		$ 422.89		$ .44	

*Includes protein supplement, molasses, salt, mineral, and antibiotic or vitamin feed supplements.

†Fourteen feeder lambs are assumed to equal one animal unit (one mature cow equivalent).

‡Less than one percent

PROFITS FROM LAMB FEEDING PROJECTS

Net returns (excess of returns over all costs) averaged $423 per project or 44 cents per lamb sold, after allowing wages of one dollar per hour for the labor used. Individual projects deviated by wide margins from the average. Eight of the 26 projects failed to cover total costs with losses as great as $8.19 per head.[4] The largest profit per head was $4.18. Half of the projects showed a profit greater than $1.00 per head after allowing wages of $1.00 per hour for the labor used.

The average return to management and labor (net returns plus wages charged) was $754 per project or $2.28 per hour of the operator's time. Nine of the projects showed returns to management and labor of more than $4.00 per hour, while six showed negative returns. For these 6, costs exceeded returns by an average of $3.25 per lamb sold.

Physical Inputs and Outputs—This study is based on the physical input-output ratios observed on 26 farms in 1957-58 and the prices paid for the inputs and received for the products during the same period. It is not likely that the physical relationships and responses in any other year would differ greatly from those found to exist at this time, but price relationships are exceedingly likely to vary.

A tabulation of physical inputs and production is presented in Tables 2 and 3 so that costs and returns can be calculated for any desired level of prices. The four columns represent the range—low and high—,the median or middle value, and the arithmetic mean. Where the median and the mean are widely separated, the median is usually a better guide to the input requirements or output likely to be experienced by any one operator. Half the observations were less than, and half greater than, the median. The mean in some cases is unduly influenced by a few extreme values.

ECONOMICS OF SCALE IN FEEDING LAMBS

The 26 projects in this study ranged in size from less than 200 to nearly 2500 lambs sold. For purposes of analysis, the projects were divided into 4 classes of 150-249, 250-349, 350-549 and 550-2500 lambs, using number of lambs sold as basis for classification (see Table 4). Since a high proportion of the death losses were incurred early in the feeding period, the final size of the project was a better basis for analyzing feed and labor requirements and project results.

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[4]The primary cause of this loss was a negative price spread of $5.44 per cwt. The feeder lambs cost $5.44 per cwt. more than the selling price of the fat lambs. The average project experienced a spread of +$2.76 per cwt.

TABLE 2.—Range and Averages of Physical Input Factors Reported by 26 Operators of Lamb Feeding Projects, Ohio, 1957-58 Season

	Range		Median	Mean
	Low	High		
Weight of lambs purchased, lbs. per head	60.1	79.8	68.2	68.9
Mortality rate (% of lambs bought)	1.2	21.8	4.8	6.2
Feed per lamb sold:				
Grain, lbs.	79	249	160	168
Protein supplement, lbs.	0	22	7	9
Other purchased feed,* lbs.	0.3	43.4	2.3	5.3
Other purchased feed, value	$ .01	$ 1.16	$ .23	$ .30
Hay, lbs.	44	274	147	145
Pasture,† lamb days	11	99	45	46
Proportion of grain from corn, %	47	100	96	92
Straw, lbs. per lamb	0	149	10	23
Labor, hours per head sold				
Time spent in daily chores	.11	1.47	.48	.53
Total labor	.22	2.02	.70	.83
Miscellaneous expenses‡	$ .53	$ 2.12	$ 1.15	$ 1.17
Time: days on farm	81	213	131	134
days on feed	68	163	108	112

*Includes molasses, salt and mineral, antibiotic and vitamin feed supplements.
†Pasture was used in only 13 projects.
‡Includes veterinary, shearing and twine, taxes, insurance, interest, etc.

TABLE 3.—Range and Averages of Physical Output Reported by 26 Operators of Lamb Feeding Projects, Ohio, 1957-58 Season

	Range		Median	Mean
	Low	High		
Weight of market lambs, lbs. per head	82.0	108.0	92.4	89.9
Gain in weight, lbs. per head	15.6	46.7	27.4	28.6
Rate of gain per head, lbs. per day	.18	.47	.25	.26
Weight of fleece, lbs.	3.6	7.0	5.0	5.0
Manure recovered, tons per head	.04	.48	.20	.22

With respect to many measures of output or of efficiency, there was little difference or little pattern in the variation among the four size classes. For example, mortality rates show some variation but no trend. However, interesting variations were discernible in labor, housing, feed, and marketing aspects.

Labor—The most obvious variation associated with increase in size was in respect to labor. While some of the labor requirements in caring for lambs were about the same whether dozens or hundreds were handled, the scatter diagram (Figure 2) indicates major improvements in labor efficiency as size of project increased.

Regular or daily chore labor per head sold declined rapidly as size of project increased up to about 400 head. After this point, reduction in chore labor per head was less pronounced. Total labor per head declined at about the same rate as chore labor. Some of the reduction in labor resulted from a shorter feeding period in the larger projects. The time spent each day in caring for 100 lambs also decreased as size of project increased.

Housing—All of the projects in this study provided barns or sheds as winter shelter for the lambs. A wide variety of types, ages and sizes of structures was found in use, ranging from new pole-frame sheds to ancient bank barns. In some cases, lambs were confined inside the barns, although usually some outdoor pen area was provided.

TABLE 4.—Mortality Rate, Labor Requirements and Housing Charges for 4 Sizes of Lamb Feeding Projects, Ohio, 1957-58 Season

	Number of lambs sold				All classes
	150-249	250-349	350-549	550-2500	
Number of cases	6	6	8	6	26
Average number of lambs sold	204	292	407	1072	487
Average mortality rate*	5.6%	5.8%	7.6%	5.4%	6.2%
Labor, hours per head sold:					
Regular chore labor	.81	.61	.41	.31	.53
Total labor	1.15	.93	.74	.55	.83
Regular chore labor per day per 100 lambs, hours	.66	.48	.39	.30	.45
Housing and equipment charge: Per lamb sold	.41	.43	.42	.38	.41
Average number of days on feed	126	124	97	106	112

*Percent of lambs lost.

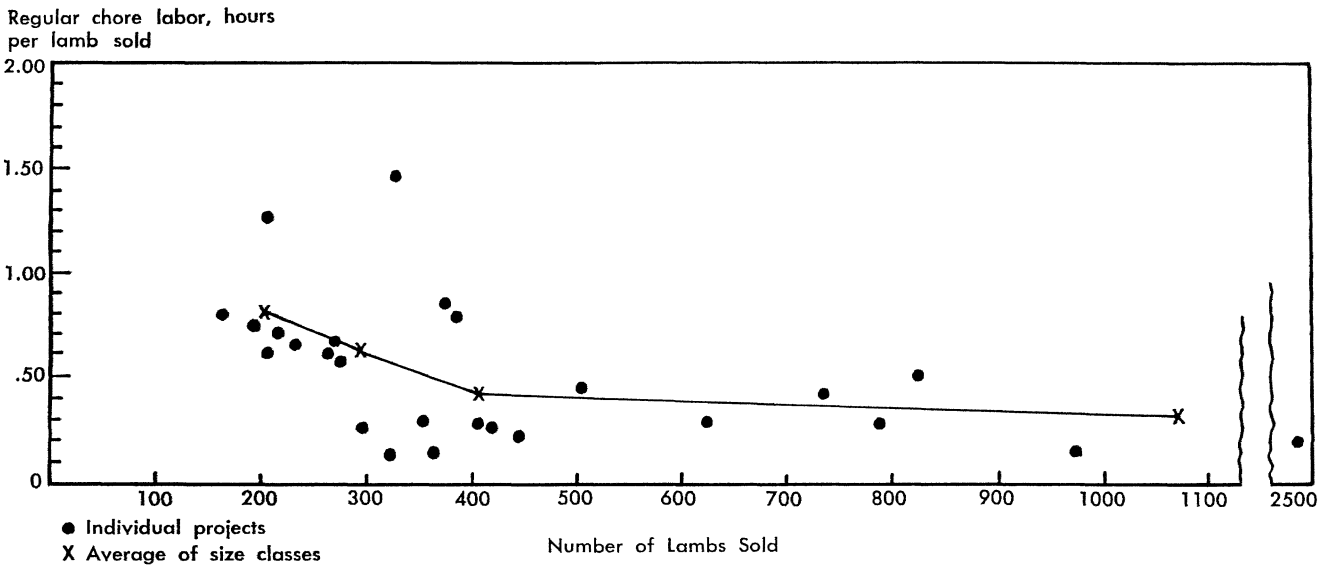

Fig. 2.—Hours of Regular Chore Labor for Lambs Sold and Size of Project, 26 Lamb Feeding Projects, Ohio, 1957-58 Season

Since the cost of the barn usually could not be determined, a uniform charge of eight and one-half cents per square foot of barn space was made regardless of the type or age of the barn. This figure is representative of the annual use cost of typical pole-frame barns currently being constructed.

In the cases where barns were used by other livestock part of the year, only a proportionate share of the annual use cost of the barn was charged to the lambs. In the smaller projects, this share averaged 50 percent, increasing to 76 percent for the largest projects. These projects, however, re-used their housing for lambs more than the smaller projects by adding more feeder lambs as fat lambs were removed. This more intensive use of facilities reduced the charge per lambs so that the large projects showed slightly lower housing and equipment charge per lamb sold than was shown by the smaller projects.

Feed—Considerable variation among individual projects was evident in the makeup of the ration and in the resulting protein content and other characteristics, but little relationship appeared to exist between these variables and size of project.

Total feed inputs per lamb sold declined as size of project increased (see Table 5). Part but not all of this decline was attributable to a shorter feeding period and smaller gain in weight for the heavier lambs. The biggest reduction in feed was in hay which declined in quantity from one-half of the ration to one-third and in cost from 29 percent of total feed cost to 15 percent. It appears that hay was wastefully used in the smaller projects. The total feed conversion ratio (total pounds of feed required per pound of gain) declined from 12.7 to 10.7, as size of projects increased, primarily as a result of this reduction in hay fed.

TABLE 5.—Efficiency of Feed Utilization of Feeder Lambs, by Size of Project, Ohio, 1957-58 Season

	Number of lambs sold				All classes
	150-249	250-349	350-549	550-2500	
Total feed per 100 lamb days, lbs.	319	280	285	286	293
Hay fed per 100 lamb days, lbs.	167	119	125	103	129
Total feed per pound of gain, lbs.	12.7	12 1	11.2	10.7	11.7
Value of concentrate feeds, per cwt*	$2.36	$2.42	$2.34	$2.40	$2.38
Total feed cost per pound of gain	20.2¢	22.8¢	19 3¢	19.8¢	20.4¢
Total feed cost per head	$6 33	$6 41	$4.75	$5 60	$5.69

*Includes all feeds other than forage.

The proportion of protein supplement in the ration was about the same for all sizes of projects. In the larger projects, more of the corn was replaced by oats, and use of antibiotic and vitamin additives increased; but the cost of the feed per 100 pounds changed very little. Efficiency of the concentrates in producing weight gains on the lambs and total feed cost per pound of gain were about the same for the different sizes of projects.

Marketing—Lambs bought for the larger projects came in at little heavier weights but at a slightly lower price per pound (see Table 6). Many of the operators would like to purchase lambs weighing 60 to 62 pounds, but in some years do not find enough quality feeders available at those weights and have to accept heavier lambs in order to fill the feed lots. These lambs were fed for shorter periods, and their feed cost per head was less.

TABLE 6.—Weights, Costs and Gains of Feeder Lambs, by Size of Flock, Ohio, 1957-58 Season

	Number of lambs sold				All classes
	150-249	250-349	350-549	550-2500	
Weight of lambs bought, lbs.	66.5	68.6	69.3	70.9	68.9
Gain in weight, lbs.	32.3	29.2	24.9	28.3	28.4
Purchase price per cwt.	$19.74	$19.88	$19.16	$19.12	$19.45
Spread (gain in price per cwt.)	$ 2.51	$ 1.85	$ 3.21	$ 3.29	$ 2.76
Gain in value per head	$ 9.76	$ 8.30	$ 8.78	$ 9.41	$ 9.04

Operators of the larger projects received a little more per hundredweight for their lambs. The spread (difference between purchase price and sale price per hundredweight) was thus somewhat greater for the operators of larger projects. The increase in value per head was more than proportional to gain in weight.

Several operators observed that larger feeders enjoyed certain marketing advantages. These advantages appear to arise from two sources. The larger operator can justify more total time and effort spent in "following the market" because the time spent per lamb is kept low by the size of the project. At the same time, large numbers may directly affect prices because of sheer bargaining power or because of the advantages to buyers and shippers in handling large shipments.

Since purchases and sales of lambs were made over a long period of time and at many different markets, it was impossible to analyze seasonal price fluctuations or price in relation to quality of lambs.

EFFECT OF METHOD OF FEEDING

The total time the average lamb was on the farm ranged from 81 to 213 days. In half the projects, the time was more than 131 days.

Pasture use was quite variable. Thirteen of the projects used no pasture. Eight of these commenced grain feeding immediately upon delivery of the lambs; the other five who confined their lambs to the barn or lot, fed little besides hay during a period of one to three weeks while more lambs were being bought. In four projects, lambs were accumulated over a similar period; but pasture was utilized as the main feed during that time. In the remaining 9 projects, lambs were kept on pasture or in stubble and stalk fields for one to 3 months, averaging 58 days.

It was impossible, under the conditions of this study, to determine accurately the weight of the lambs at the time they came off pasture. Certainly those farmers who pastured their lambs for extended periods did so with the expectation that some gains would be made. However, in the absence of any way to determine how much gain was made on pasture, it was assumed that all gains were made while in the feed lot. This assumption results in a calculated rate of gain which, in some cases, is unrealistic.

Hand-feeding and self-feeding methods were observed. As used in this study, these terms refer to the method of feeding grain or prepared feed. Hay was hand fed in all cases, and lambs received a full or relatively full feed of hay. Typically, water and salt were available at all times.

Hand-fed lambs were usually fed twice a day. The ration of grain and other concentrates was adjusted in quantity and, in some cases, in makeup to suit the condition and appetite of the lambs. Self-fed lambs were brought up to a full feed during a period of hand feeding after which shelled corn or a prepared ration was supplied in feeders which allowed lambs to eat their fill at any time. In most cases, some supplement was either mixed with the shelled corn or fed separately in troughs. In three cases, the prepared ration supplied in the feeders was a ground and mixed ration made up of ear corn, oats, protein supplement and molasses. In one case, a ground ration was fed in pelleted form; in this case, no cobs or oats were included in the makeup of the feed.

Labor—One of the advantages usually claimed for the self-feeding method of feeding lambs is the reduction of labor. This study tends to substantiate these claims.

With self-feeding of grain and concentrates, the regular or daily chores which must be done on schedule are reduced. Time spent on this type of work with hand feeding averaged 31 minutes per day for each 100 lambs; where self-feeding of grain was practiced, the daily chores amounted to only 23 minutes per 100 head. It is possible that self-feeding an all-in-one ration, including ground hay, would further reduce the regular or daily chores.

With any method of feeding, certain tasks must be done periodically, at intervals of several days to a week or more. Such periodic chores may include filling self-feeders, preparing feed, distributing bedding, cleaning feeders and watering tanks, etc. Time spent on these tasks was greater for self-feeding than for hand-feeding.

Adding together the regular or daily chores and the periodic tasks, the time required to care for 100 lambs for an average week was about 7 percent less for self-feeding than for hand-feeding. This savings amounted to 1.3 hours each week for a typical project. But those who self-fed had larger projects. We could expect them to experience that much labor saving due to increased size alone.

In addition to the daily chores and the periodic tasks just discussed, a lamb feeding project requires some time to be spent on such tasks as buying and selling the lambs, hauling or delivery of the lambs, medication or "doctoring" and allied tasks. Work of this nature required about the same amount of time per head sold regardless of method of feeding.

The average labor input, including all time spent with the lambs, was 0.96 hour per head sold for hand-fed lambs and 0.71 hour per head sold for self-fed lambs. However, the self-fed lambs were on feed three weeks less time and gained two and one-half pounds less than the hand-fed lambs.

Feed Efficiency—Caution must be used in interpreting the results obtained with hand-fed and with self-fed lambs in this study for there were also differences in the rations fed and other factors. Under the conditions of this study, it was not possible to separate the effects of the method of feeding from the effects of other factors.

TABLE 7.—Efficiency in Feed with Two Methods of Feeding Lambs, Ohio, 1957-58 Season

	Method of feeding		Average
	Hand-fed	Self-fed	
Number of projects	13	13	26
Number of lambs sold per project	386	588	487
Rate of gain, lbs. per day	.247	.272	.260
Gain in weight per lamb, lbs.	29.8	27.3	28.6
Feed cost of concentrate ration per cwt.	$2.21	$2.37	$2.29
Feed plus processing cost of concentrate ration per cwt.	$2.26	$2.49	$2.38
Concentrates fed per lb. of gain, lbs.	5.79	7.35	6.57
Total feed cost per lb. of gain	$.182	$.227	$.204
Average days in feed lot	122	102	112

Gains were 10 percent more rapid where grain was self-fed (see Table 7). This higher rate of daily gain was probably due to lambs eating more corn and less hay when self fed. The self-fed lambs received 129 pounds of hay per lamb sold; while the hand-fed lambs got about one-fourth more or 162 pounds. Self-fed lambs consumed 194 pounds of grains, concentrates, salt and minerals; while the hand-fed lambs received only 171 pounds or 12 percent less.

This substitution of grain for hay increased the cost of the ration. The self-fed rations also included more of other high-cost ingredents and involved more processing costs. As a result, total feed cost per pound of gain was about one-fourth higher for self-fed lambs.

Mortality—Perhaps more important than the rapidity of gain was the variation in mortality rate. Overall average death loss was 6.2 percent of the lambs purchased (see Table 8). Farmers' statements (which were usually not verified by autopsies) indicated that overeating was the leading cause of death. Other causes were pneumonia and respiratory ailments resulting from exposure or parasites.

Heavier death losses were experienced by those whose lambs were self-fed grain. Their losses averaged 7.4 percent compared to 5.1 percent for hand feeding. Two of the self-feeding projects had losses of about 20 percent, nearly twice as high as the highest death loss among hand-feeding projects. Half of the hand-feeding projects had mortality rates above 4.0 percent, while half the self-fed projects were above 5.6 percent.

TABLE 8.—Mortality Rates and Measures of Profitability with Two Methods of Feeding Lambs, Ohio, 1957-58 Season

	Method of feeding		Average
	Hand-fed	Self-fed	
Average of mortality rates	5.1 %	7.4 %	6.2 %
Total costs per lamb sold	$22.19	$22.93	$22.56
Total returns per lamb sold	$22.95	$23.06	$23.00
Net returns per lamb sold	$+.76	$+.12	$+.44
Return to labor and management	$ 1.72	$ .83	$ 1.27
Wages earned per hour	$ 1.79	$ 1.21	$ 1.53

Of the 13 self-feeding projects, 9 used shelled corn as the principal ingredient in the ration. In these 9 projects, the average mortality rate was 8.9 percent. The other 4, self feeding a more bulky ration, had death losses of only 4.0 percent. Because of the limited number of cases involved, this measure is inconclusive; however, the unproved inference of less digestive trouble with a more bulky ration is in line with the indications of logic and experience.

No conclusions could be drawn from this study concerning the effects of vaccination against overeating disease or of using antibiotics in the ration because of variability in time and method of use and in results obtained.

Profits—The profitability of the lambs fed under the various methods may be used as a criterion for choice among these methods. While efficiency in feed conversion and in use of labor are desirable features in a lamb feeding operation, it should be noted that price and weight of the feeder lambs, mortality rates, housing costs, etc. may influence profit as much as or more than the technical efficiency of different systems.

Total costs for individual projects ranged from $17.43 to $27.42 per lamb sold and averaged $22.56. Costs averaged higher for self-feeding projects largely because of the higher death loss.

Total returns for individual projects ranged from $18.98 to $27.47 per lamb sold, with an average of $23.00. The average of total returns for hand-feeding and self-feeding were almost identical. As a result, the average net returns were greater for the hand-fed lambs than for the self-fed lambs. The average of 26 projects shows a 44 cents per head profit.

ALTERNATIVE MEASURES OF SUCCESS

For some operators, the concept of hourly wages for farm work may not be meaningful, either because full-time employment is not assured or because, under their circumstances, labor has no alternative use at an hourly rate. In such cases, a more useful measure is total return to labor and management. This is the same as net return plus labor charge as these figures have been computed here.

The average return to labor and management for 26 projects was $1.27 per lamb sold. Using hand feeding, 13 projects averaged $1.72 per lamb sold. The 13 projects using self feeding averaged $ .83 per lamb sold.

Expressing all of the net return to labor and management as wages, the 26 projects averaged $1.53 per hour worked. Hand feeding paid wages of $1.79 per hour, while operators using self feeding averaged $1.21 per hour spent with the sheep project.

Fixed and Variable Costs—So far, in considering costs, we have tried to include all items of costs. Some of the costs are for use of facilities or for labor where there may be no immediate outlay of cash. Most of the other items represent cash costs that must be paid if lambs are fed.

TABLE 9.—Average Variable Costs of Feeding Lambs in 26 Ohio Feeding Projects, 1957-58 Season

		Cost
Purchase of feeder lamb		$13.61
Grain	$3.46	
Purchased feeds	.69	
Hay	1.24	
Feed processing and hauling	.17	
Total variable feed cost		5.56
Death loss		.68
Hired services: shearing and veterinary		.68
Straw		.17
Taxes, insurance and miscellaneous costs		.23
Total variable costs		$20.93
Total return		$23.00
Net returns above variable costs		$ 2.07

Some of the charges are of a type that will continue if lambs are fed or not. The taxes, insurance, repairs and depreciation on buildings and equipment are good examples. Many times the labor of the operator and of other members of his family is available without any additional cost. The same may be true of pasture. These are examples of fixed or overhead costs—charges that are fixed or must be met whether anything is produced or not.

Variable costs, such as feed, feed processing, veterinary, medicine, drenching, dipping, hauling, shearing and cost of feeder lambs, are those that vary with output. If no lambs are fed no costs are incurred.

If feeding lambs yields a net return greater than the variable costs, it is better in the short-run to feed than to let the resources go unused. This is especially true if there are no acceptable alternative uses for the facilities, labor and pasture.

A farmer who regularly feeds lambs may question whether he should do so in any given year with the existing price outlook. In this situation, the prospective return above variable costs is an appropriate guide. Of course, such a guide should be based on probable feed requirements, mortality, and other physical relationships for the project under consideration and on the prices expected.

Analysis based on variable costs alone, disregarding the fixed costs of labor, facilities and pasture, presents a different picture. While 8 projects failed to cover all costs, only 4 failed to cover variable costs. Of these 4, two had death losses of about 20 percent, and 2 received less per pound for their lambs than they paid for the feeders. The 26 projects averaged a net return (above both fixed and variable costs) of 44 cents per head, but the average return above variable costs was $1.82 per head. Hand-feeding projects averaged $2.36 per head above variable costs and self-feeding projects, $1.27. Size of the operation made but little difference in the return per head above variable costs.

Return above variable costs can also be computed as interest on the investment in variable costs or as an hourly wage for the labor used.

In this study, the returns above variable costs were enough in one-half the projects to pay wages of $3.03 or more per hour of labor used. The self-fed projects paid $ .10 per hour more than this; the hand-fed projects, $ .10 less.

Calculating returns above variable costs as interest on investment (as a percent of variable costs), half the projects paid more than 9.7 percent. Since this return was gained in the 135 days (average) which the lambs were on the farm, it is comparable to an annual rate of over 35 percent. The median rates of return were 11.9 percent for hand-fed projects and 7.4 percent for self-fed.

CONCLUSIONS

THE ADAPTATION OF LAMB FEEDING TO CORN BELT FARMING

It is apparent from the findings of this study that lamb feeding projects have some requirements which limit their adaptability but also have some features which make them a particularly apt choice for certain farming situations. The most important of these characteristics are the seasonality of labor inputs, the use of products and facilities with low or nonexistent opportunity cost, capital requirements and risk. Farmers' opinions regarding adaptability to these characteristics explain why feeder lamb projects are found on Corn Belt farms.

The seasonal aspect of lamb feeding, with virtually all the labor requirements falling in the season of otherwise low demand for labor, makes feeder lambs almost unique among livestock, since this project can be added to a farm without competing for the seasonal field labor. The farms in this study averaged in size close to 200 acres per man, and all of them had other livestock in addition to lambs. Had the labor requirement for the lamb project not been concentrated in the "slack season," it is doubtful whether the same labor force could have handled the additional burden. On the other hand, the available labor force would have been underemployed during this season if the lamb feeding project had been eliminated.

Some hay (or at least meadow) is produced on most farms in the Corn Belt. The grain which is produced can be sold at any of several commercial elevators, but hay may be virtually unsalable in some localities or in some seasons. Interest in keeping livestock frequently centers around "feeding up" the hay. The most often stated reason for feeding lambs was that it paid a better return for the crops than the alternative of selling the hay and grain.

Existing buildings of almost any type, from bank barns to pole sheds, can be used for lambs. Where these buildings are already on hand and have no effective alternative use, as was the case on many of these farms, their adaptation to housing lambs provides housing essentially cost-free.

Capital requirements for typical lamb feeding projects represent a substantial addition to the already large capital requirements for farming. In general, it is the farmers who have ownership or control of resources adequate for efficient large scale farming who are able to finance a lamb feeding project.

Risk is an element present in all enterprises and in all agricultural production. However, the element of risk is more important in lamb feeding than in some other phases of agriculture. Nearly one-third of the projects in this study failed to cover all their costs. The farmer who feeds lambs must be both willing and financially able to carry the risk.

Another necessary characteristic of the man who is to succeed with feeder lambs is that he must like sheep. While it is not necessary to live with feeder lambs to the same extent that one must take up residence with sows at farrowing or ewes at lambing, certain personality attributes are essential to success. "The eye of the master," which fattens the lambs as well as the cattle, is composed in large part of an attitude, a liking for the livestock involved.

The adaptation of lamb feeding to corn belt farming may be summed up as follows:

Where housing and labor are available at low cost and where the operator is both willing and financially able to bear the risk, lamb feeding may be recommended as a method of marketing grain and hay.

Where large expenses must be incurred for housing, labor must be hired, or feed purchased, lamb feeding should prove attractive only to those who are skillful in preventing death loss and achieving efficient gains and who also thrive on risk.

SUMMARY OF FINDINGS

The costs experienced by 26 operators of commercial lamb feeding projects in central Ohio in the 1957-58 season averaged $22.56 per lamb sold. The purchase cost of the feeder lamb accounted for 60 percent of this or $13. 61. Death losses (6.2 percent of the lambs purchased) resulted in a mortality charge of $.68 on each lamb marketed. Feed made up 25 percent of costs or $5.69, of which about one dollar was out-of-pocket expense for purchased feed and processing. Labor averaged .83 hours per head sold and represented 4 percent of costs. Other expenses made up 8 percent of the costs.

The returns from feeder lamb projects averaged $23.00 per lamb sold. Of this, 89 percent came from sale of the lamb and 8 percent from wool. Manure credit made up the other 3 percent.

Net return averaged 44 cents per head sold.

Feed consumed per lamb sold averaged as follows: grain, 168 pounds; hay, 145 pounds; and purchased feed (primarily protein and supplements), 15 pounds. Use of pasture was variable; only one-third of the operators used pasture for an average of a little more than 3 weeks per lamb.

The larger projects required much less labor per lamb, with the reduction occurring primarily in daily chore labor. The larger projects used less hay per lamb, but efficiency of feed utilization and the feed cost per pound of gain did not seem to be related to size of project. Large projects appeared to have certain advantages in marketing.

Both hand feeding and self-feeding were observed. Self-feeding required less labor, particularly for daily chores. Self-feeding also had higher mortality. Hand feeding gave larger net returns. The advantages of self-feeding in regard to labor efficiency and faster rate of gain were more than offset in this study by the disadvantage of higher mortality rates.

A tabulation of physical inputs and production as reported from 26 projects is presented on page 10, so that costs and returns can be calculated for any desired level of prices.